AEROLOGICAL OBSERVATIONS

[Aerological Division, D. M. LITTLE, in charge]

By L. T. SAMUELS

Free-air temperatures during December averaged lowest over the northeastern section of the country, and highest over the extreme southern stations (see table 1). Departures from normal at those stations having a sufficiently long record for the determination of normals were negative with the exception of Omaha and Pearl Harbor where positive departures occurred. In all cases the temperature departures were of small to moderate magnitude.

Free-air relative humidities averaged highest over the northwestern and northeastern parts of the country, and lowest over the extreme south, with a secondary minimum over the middle Pacific coast.

Free-air wind resultants were close to normal in direction. They were below normal in velocity over most northern stations, and above normal over the southern stations.

TABLE 1.—*Free-air temperatures and relative humidities obtained by airplanes during December 1934*

TEMPERATURE (° C.)

Stations	Altitude (meters) m. s. l.																	
	Surface		500		1,000		1,500		2,000		2,500		3,000		4,000		5,000	
	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal
Billings, Mont.[1] (1,088 m)	−3.6						−0.1		−0.9		−3.5		−7.1		−13.5		−20.1	
Boston, Mass.[2] (6 m)	−3.9		−5.3		−7.0		−9.5		−10.6		−12.2		−14.4		−19.6		−27.5	
Cheyenne, Wyo.[1] (1,873 m)	−2.9								−1.6		−0.9		−3.9		−9.4		−16.0	
Fargo, N. Dak.[1] (274 m)	−12.9		−12.6		−10.9		−7.7		−8.1		−10.1		−12.4		−17.8		−24.2	
Kelly Field (San Antonio), Tex.[3] (206 m)	8.2		11.7		11.7		10.8		9.5		7.7		5.9		−0.3		−7.3	
Lakehurst, N. J.[4] (39 m)	−2.0		−1.5		−3.7		−4.6		−6.0		−8.9		−11.1		−15.4		−22.9	
Maxwell Field (Montgomery), Ala.[3] (52 m)	4.1		6.4		6.0		6.0		5.3		4.2		2.2		−3.4		−8.2	
Mitchel Field (Hempstead, L. I.), N. Y.[3] (29 m)	−2.7		−3.5		−4.8		−5.9		−6.7		−9.0		−11.5		−16.1		−22.3	
Murfreesboro, Tenn.[1] (174 m)	0.8		1.8		0.4		0.1		−0.9		−2.8		−4.4		−8.2		−14.6	
Norfolk, Va.[4] (10 m)	3.7	−0.7	3.7	−0.3	1.9	−0.7	0.8	−0.9	−0.4	−1.1	−2.3	−1.1	−4.3	−1.1	−9.8	−1.2	−15.0	−1.2
Oklahoma City, Okla.[1] (391 m)	1.1		2.8		5.5		4.8		2.8		0.3		−2.2		−7.9		−15.3	
Omaha, Nebr.[1] (300 m)	−5.4	(6)	−5.3	(6)	−3.7	−0.8	−1.0	+1.6	−2.3	+1.7	−4.5	+1.8	−6.9	+1.8	−11.9	+2.0	−18.1	+1.3
Pearl Harbor, Territory of Hawaii[4] (6 m)	21.6	−2.7	21.2	+0.5	17.8	+0.8	14.9	+0.4	13.0	+0.6	11.3	+0.8	8.7	+0.4	3.3	+0.4	−1.7	+0.4
Pensacola, Fla.[4] (24 m)	5.0	−5.5	6.9	−3.8	6.2	−3.9	6.6	−2.4	6.2	−1.5	4.6	−1.1	2.5	−1.0	−2.1	−0.6	−7.5	−0.3
San Diego, Calif.[4] (10 m)	10.7	−2.1	13.7	+0.4	12.5	−0.1	9.7	−0.8	7.0	−1.4	4.2	−1.7	1.5	−1.9	−4.2	−1.7	−10.2	−1.6
Scott Field (Belleville), Ill.[3] (135 m)	−3.4		−1.5		−0.6		−1.2		−2.6		−4.6		−6.1		−10.5		−15.9	
Selfridge Field (Mount Clemens), Mich.[3] (177 m)	−3.9		−3.6		−4.7		−5.7		−7.2		−9.0		−10.9		−15.8		−22.2	
Spokane, Wash.[5] (596 m)	0.7				0.9		0.6		−0.5		−2.7		−5.5		−11.9		−18.7	
Sunnyvale, Calif.[4] (10 m)	8.9		9.7		8.9		7.4		5.0		3.0		0.3		−5.6		−11.7	
Washington, D. C.[4] (13 m)	1.1	−0.4	1.0	−0.7	−0.7	−1.4	−2.2	−1.7	−3.3	−1.7	−4.9	−1.2	−6.5	−1.5	−10.6	−1.3	−15.7	−1.3
Wright Field (Dayton), Ohio[3] (244 m)	−3.0		−3.1		−3.3		−4.3		−5.3		−7.0		−8.8		−13.5		−19.2	

RELATIVE HUMIDITY (PERCENT)

Billings, Mont.[1] (1,088 m)	69						56		52		52		54		53		50	
Boston, Mass.[2] (6 m)	70		69		69		69		64		58		56		55		41	
Cheyenne, Wyo.[1] (1,873 m)	61								59		53		52		49		44	
Fargo, N. Dak.[1] (274 m)	88		84		78		64		58		55		51		50		48	
Kelly Field (San Antonio), Tex.[3] (206 m)	87		71		57		47		40		40		36		33		25	
Lakehurst, N. J.[4] (39 m)	84		78		75		70		65		64		62		57		55	
Maxwell Field (Montgomery), Ala.[3] (52 m)	83		67		59		46		40		38		36		34		31	
Mitchel Field (Hempstead, L. I.), N. Y.[3] (29 m)	75		66		62		56		51		51		50		45		47	
Murfreesboro, Tenn.[1] (174 m)	80		72		70		56		50		48		41		36		35	
Norfolk, Va.[4] (10 m)	70	−1	61	−1	56	−2	51	0	45	+1	43	0	43	+1	40	0	33	0
Oklahoma City, Okla.[1] (391 m)	80		74		61		53		47		43		40		37		35	
Omaha, Nebr.[1] (300 m)	87	(6)	84	(6)	75	+12	61	+4	57	+2	54	−2	52	−5	51	−6	49	−8
Pearl Harbor, Territory of Hawaii[4] (6 m)	84	+11	80	+4	80	+3	76	+5	68	+5	60	+6	54	+8	48	+8	43	+8
Pensacola, Fla.[4] (24 m)	72	−10	61	−13	54	−12	43	−16	34	−19	32	−19	31	−18	27	−13	25	−13
San Diego, Calif.[4] (10 m)	82	+15	66	+8	57	+9	54	+12	53	+17	47	+15	44	+15	43	+16	40	+17
Scott Field (Belleville), Ill.[3] (135 m)	82		69		60		49		47		44		40		40		39	
Selfridge Field (Mount Clemens), Mich.[3] (177 m)	84		77		72		63		51		44		42		38		38	
Spokane, Wash.[5] (596 m)	85				83		74		65		63		61		54		56	
Sunnyvale, Calif.[4] (10 m)	70		61		52		44		43		37		36		35		37	
Washington, D. C.[4] (13 m)	69	−3	62	−2	59	0	55	0	48	−2	41	−5	39	−4	37	−5	35	−5
Wright Field (Dayton), Ohio[3] (244 m)	81		79		70		60		51		45		45		43		44	

Observations taken about 5 a. m., 75th meridian time, except along the Pacific coast and Hawaii where they are taken at daylight.

[1] Weather Bureau. [2] Massachusetts Institute of Technology. [3] Army. [4] Navy. [5] National Guard.

[6] Surface and 500-meter level departures omitted because of difference in time of day between airplane observations and those of kites upon which the normals are based.

LATE REPORTS FOR NOVEMBER 1934

TEMPERATURE (° C.)

Stations	Altitude (meters) m. s. l.																	
	Surface		500		1,000		1,500		2,000		2,500		3,000		4,000		5,000	
	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal
Pearl Harbor, Territory of Hawaii (6 m)	22.5	−3.2	21.9	+0.2	18.6	+0.8	15.3	+0.2	13.9	+0.8	12.2	+1.0	9.8	+0.8	4.0	+0.7	−0.6	+0.7

RELATIVE HUMIDITY (PERCENT)

Pearl Harbor, Territory of Hawaii (6 m)	84	+15	81	+7	82	+4	82	+9	73	+8	64	+9	58	+12	50	+12	47	+12

TABLE 2.—*Free-air resultant winds (meters per second) based on pilot-balloon observations made near 7 a. m. (E. S. T.) during December 1934*

[Wind from N=360°, E=90°, etc.]

Altitude (m) m. s. l.	Albuquerque, N. Mex. (1,554 m)		Atlanta, Ga. (309 m)		Bismarck, N. Dak. (518 m)		Brownsville, Tex. (7 m)		Burlington, Vt. (132 m)		Cheyenne, Wyo. (1,873 m)		Chicago, Ill. (192 m)		Cleveland, Ohio (245 m)		Dallas, Tex. (154 m)		Havre, Mont. (762 m)		Jacksonville, Fla. (14 m)		Key West, Fla. (11 m)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
	°		°		°		°		°		°		°		°		°		°		°		°	
Surface	355	1.7	314	1.8	313	1.1	321	0.2	223	0.8	281	5.3	277	2.5	234	1.8	14	0.1	253	3.0	321	1.4	39	2.6
500			314	3.5			156	3.8	249	3.8			284	3.7	235	4.6	256	4.4			308	2.8	82	3.7
1,000			285	6.0	295	7.5	161	3.0	285	8.0			287	4.6	246	6.4	286	6.6	262	5.6	260	5.1	116	3.2
1,500			293	8.0	296	8.6	211	2.9	296	10.5			281	5.9	250	8.1	300	7.7	281	10.0	267	7.0	113	1.3
2,000	320	2.3	285	10.3	294	12.4	230	3.7	301	10.0	282	7.6	270	5.2	255	8.8	302	9.1	288	9.3	271	9.6	213	0.6
2,500	294	4.3	274	12.7	300	11.8	264	4.4	300	12.3	285	13.7	292	9.3	271	10.0	294	10.9	294	10.5	277	11.0	250	1.7
3,000	287	7.3	262	13.4	293	13.2	283	5.8	293	12.0	288	13.0	312	9.6	279	7.6	288	13.0	291	11.8	273	12.5	227	2.3
4,000	287	9.9					278	8.2			300	12.9			280	10.2	280	13.5	296	11.3			182	3.8
5,000	266	7.6					276	9.1																

Altitude (m) m. s. l.	Los Angeles, Calif. (217 m)		Medford, Oreg. (410 m)		Memphis, Tenn. (83 m)		New Orleans, La. (19 m)		Oakland, Calif. (8 m)		Oklahoma City, Okla. (402 m)		Omaha, Nebr. (306 m)		Phoenix, Ariz. (338 m)		Salt Lake City, Utah (1,294 m)		Sault Ste. Marie, Mich. (198 m)		Seattle, Wash. (14 m)		Washington, D. C. (10 m)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
	°		°		°		°		°		°		°		°		°		°		°		°	
Surface	6	1.4	183	0.5	271	0.3	14	2.1	68	0.9	283	0.7	343	1.8	87	1.6	173	1.6	56	1.3	196	3.2	305	1.6
500	39	1.5	246	0.2	264	3.4	331	1.1	23	4.7	286	2.2	312	2.4	77	3.2			6	1.2	208	6.7	305	5.7
1,000	59	2.2	170	2.8	264	6.3	290	4.0	10	5.4	296	6.2	298	5.5	88	2.5			301	3.2	220	6.1	311	6.8
1,500	59	2.1	205	3.3	284	7.4	283	5.5	354	4.1	290	7.4	288	6.4	122	2.6	188	2.7	316	4.9	232	7.0	309	9.5
2,000	41	1.2	229	2.9	287	9.0	281	7.3	357	5.6	286	9.4	282	8.8	197	0.8	205	2.3	309	6.6	242	9.3	304	11.3
2,500	4	2.8	253	3.4	286	11.9	279	8.3	359	7.3	286	10.3	285	10.2	213	1.5	241	3.3	316	6.6	231	8.7	303	12.5
3,000	345	4.7	275	3.9	275	13.7	272	10.8	341	6.5	278	11.3	278	7.9	270	2.5	255	5.3	348	8.0	243	10.5		
4,000	330	5.7	244	5.7					286	3.8	266	14.2			263	4.2	297	4.5	335	13.6				
5,000															250	5.9								

AEROLOGICAL OBSERVATIONS FOR THE YEAR 1934

[Aerological Division, D. M. LITTLE in charge]

By L. T. SAMUELS

In July the number of airplane weather observation stations was materially increased in consequence of the cooperative program of the Navy and War Departments and the Weather Bureau. A total of 24 such stations, including 1 at Boston operated by the Massachusetts Institute of Technology and 1 at Toronto operated by the Canadian Meteorological Service, were making observations at the end of 1934. The total number of pilot-balloon stations in operation by the Weather Bureau at the end of 1934 was 76, an increase of 2 over the previous year.

Only those stations having a year's record are included in table 1. Free-air temperatures averaged mostly above normal except at the stations along the Gulf and eastern seaboard, where negative departures occurred. Free-air relative humidities averaged above normal except at Omaha and Seattle, where they averaged below normal.

During the International month of January, the Weather Bureau released 46 sounding balloons at Omaha, Nebr. Ninety-six percent, i. e., 44, of the meteorographs were found and returned.